

CLAIMS

1. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, characterized in that:

light is illuminated to the recording medium to create near-field light on a surface of the recording medium, and a probe having a microscopic aperture being brought into proximity to the surface of the recording medium;

an intensity of propagation light being detected to control a distance between the microscopic aperture and the recording medium based on the intensity of the propagation light.

2. A recording apparatus for reproducing information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating means for illuminating illumination light to the recording medium such that near-field light is created on a surface of the recording medium;

a light detecting means for detecting propagation light caused by scattering the near-field light by the microscopic aperture to turning this into a reproduced signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the reproduced signal.

3. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating/recording means for introducing illumination light to the microscopic aperture such that near-field light is created in the microscopic aperture;

a light detecting means for detecting propagation light caused by scattering the near-field light by the recording medium to turning this into a reproduced signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the reproduced signal.

4. A recording apparatus for reproducing information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating means for illuminating illumination light having a definite wavelength width or a plurality of

wavelengths to the recording medium such that near-field light is created on a surface of the recording medium;

a scattering light detecting means for detecting scattering light caused as a result of interaction of the near-field light with the recording medium or the aperture element correspondingly to the wavelength of the illumination light;

a control means for controlling a spacing between the aperture element and the recording medium based on the scattering light.

5. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating/recording means for illuminating illumination light having a definite wavelength width or a plurality of wavelengths to the microscopic aperture such that near-field light is created in the microscopic aperture, and recording information to the recording medium through illumination light having one of the plurality of wavelengths;

a scattering light detecting means for detecting scattering light caused as a result of interaction of the near-field light with the recording medium or the aperture

element correspondingly to the wavelength of the illumination light;

a control means for controlling a spacing between the aperture element and the recording medium based on the scattering light.

6. A recording apparatus according to claim 4 or 5, wherein the plurality of wavelength of the illumination light is switched in time.

7. A recording apparatus according to claim 4 or 5, wherein the scattering light detecting means has a selection wavelength to be switched in time.

8. A recording apparatus according to claim 4 or 5, wherein the wavelength of the illumination light is plurality in number to be simultaneously inputted.

9. A recording apparatus according to claim 4 or 5, wherein the scattering light detecting means has a plurality of light receiving means to receive correspondingly to respective ones of different wavelengths of the illumination light.

10. A recording apparatus according to claim 4 or 5, wherein the illumination light comprises a plurality of wavelength components, the illumination light having a definite width of a wavelength width with respect to respective ones of the plurality of wavelengths.

11. A recording apparatus according to claim 4 or 5, wherein the illumination light has a wavelength having a definite width, a wavelength selecting means selecting one part of the width.

12. A recording apparatus for reproducing information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

- an aperture element having a microscopic aperture to create or scatter near-field light;

- a light illuminating means for illuminating illumination light mixed with different two of modulation frequency light to the recording medium such that near-field light is created on a surface of the recording medium;

- a first light detecting means for scattering the created near-field light by the microscopic aperture and detecting propagation light having one of the two modulation frequencies, turning this into a reproduced signal;

- a second light detecting means for scattering the created near-field light by the microscopic aperture and detecting propagation light having the other of the two modulation frequencies, turning this into a control signal;

- a control means for controlling a spacing between the aperture element and the recording medium based on the control signal.

13. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating/recording means for illuminating illumination light mixed with different two modulation frequencies to the microscopic aperture to create near-field light in the microscopic aperture, and recording information to the recording medium through illumination light having one of at least the two modulation frequencies;

a first light detecting means for scattering the created near-field light by the microscopic aperture and detecting propagation light having one of the two modulation frequencies, turning this into a reproduced signal;

a second light detecting means for scattering the created near-field light by the microscopic aperture and detecting propagation light having the other of the two modulation frequencies, turning this into a control signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the control signal.

14. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having two microscopic apertures to create or scatter near-field light;

a light illuminating means for illuminating illumination light to the recording medium such that near-field light is created on a surface of the recording medium;

a first light detecting means for detecting propagation light caused by scattering the near-field light by one of the microscopic apertures, turning this into a reproduced signal;

a second light detecting means for detecting propagation light caused by scattering the near-field light by the other of the microscopic apertures, turning this into a control signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the control signal.

15. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having two microscopic apertures to create or scatter near-field light;

a first light illuminating means for illuminating illumination light to the recording medium such that near-field light is created on a surface of the recording medium;

a second light illuminating/recording means for illuminating illumination light to one of the microscopic

apertures such that near-field light is created in the microscopic aperture;

a first light detecting means for detecting propagation light caused by scattering the near-field light by one of the microscopic apertures, turning this into a reproduced signal;

a second light detecting means for detecting propagation light caused by scattering the near-field light by the other of the microscopic apertures, turning this into a control signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the control signal.

16. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having two microscopic apertures to create or scatter near-field light;

a light illuminating/recording means for introducing illumination light to one of the microscopic apertures such that near-field light is created in the microscopic aperture;

a light illuminating means for introducing illumination light to the other of the microscopic apertures such that near-field light is created in the microscopic aperture;

a first light detecting means for detecting propagation light caused by scattering the near-field light by one of the microscopic apertures, turning this into a reproduced signal;

a second light detecting means for detecting propagation light caused by scattering the near-field light by the other of the microscopic apertures, turning this into a control signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the control signal.

17. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having two microscopic apertures to create or scatter near-field light;

a light illuminating/recording means for introducing illumination light to one of the microscopic apertures such that near-field light is created in the microscopic aperture;

a light illuminating means for illuminating illumination light to the other of the microscopic apertures such that near-field light is created in the microscopic aperture;

a first light detecting means for detecting propagation light caused by scattering the near-field light by one of the microscopic apertures, turning this into a reproduced signal;

a second light detecting means for detecting propagation light caused by scattering the near-field light by the other of the microscopic apertures, turning this into a control signal;

a control means for controlling a spacing between the aperture element and the recording medium based on the control signal.

18. A recording apparatus according to any one of claims 14 to 17, wherein the aperture element is provided with a step in a thickness direction to have a first bottom surface and a second bottom surface, the first bottom surface being provided with the one of microscopic apertures, the second bottom surface being provided with the other of microscopic apertures;

the control means calculating a relative value of the reproduced signal detected by the first light detecting means and the signal detected by the second light detecting means, and controlling the spacing between the aperture element and the recording medium based on the relative value.

19. A recording apparatus for reproducing information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating means for illuminating illumination light to the recording medium such that near-field light is created on a surface of the recording medium;

a light detecting means for detecting propagation light caused by scattering the near-field light by the microscopic aperture;

a vertical fine vibrating means for causing the microscopic aperture in a thickness direction of the aperture element;

a control means for rendering as a reproduced signal a signal detected by the light detecting means when the microscopic aperture reaches a desired height due to the vertical fine vibrating means and as a to-be-operated signal a signal detected by the light detecting means when the microscopic aperture reaches a point above the desired height due to the vertical fine vibrating means, and calculating a relative value of the reproduced signal and the to-be-operated signal to control a spacing between the aperture element and the recording medium based on the relative value.

20. A recording apparatus for reproducing or recording information recorded on a recording medium by utilizing near-field light, the recording apparatus, comprising:

an aperture element having a microscopic aperture to create or scatter near-field light;

a light illuminating/recording means for introducing illumination light to the microscopic aperture such that near-field light is created in the microscopic aperture;

a light detecting means for detecting propagation light caused by scattering the near-field light by the microscopic aperture;

a vertical fine vibrating means for causing the microscopic aperture in a thickness direction of the aperture element;

a control means for rendering as a reproduced signal a signal detected by the light detecting means when the microscopic aperture reaches a desired height due to the vertical fine vibrating means and as a to-be-operated signal a signal detected by the light detecting means when the microscopic aperture reaches a point above the desired height due to the vertical fine vibrating means, and calculating a relative value of the reproduced signal and the to-be-operated signal to control a spacing between the aperture element and the recording medium based on the relative value.

21. A recording apparatus according to any one of claims 1 to 20, further comprising a horizontal fine vibrating means for causing the aperture element to finely vibrate in a direction perpendicular to a direction of arrangement of information units recorded on the recording medium and a direction parallel with a surface of the recording medium, and

a position control means for controlling a position of the aperture element such that the reproduced signal becomes a maximum in a vibration center of fine vibration due to horizontal fine vibrating means.